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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates especially to the ingredient and shaping about the piston for internal combustion engines.

[0002]

[Description of the Prior Art] There is a technique indicated by JP,10-152734,A as a Prior art. It consists of a Magnesium alloy with which it sank in into the opening inside the fly ash Plastic solid of the porosity which fabricates fly ash in a predetermined configuration and changes as a member by which the abrasion resistance of the piston for internal combustion engines, a cylinder block, etc. is needed for this technique, and a fly ash Plastic solid, and using the metal complex constituted so that fly ash might be exposed to a front face is indicated.

[0003] According to this technique, it can contribute to recycle or energy saving by using the fly ash which is industrial waste. Moreover, abrasion resistance can be remarkably raised by exposing a fly ash Plastic solid to the sliding surface of metal complex.

[0004]

[Problem(s) to be Solved by the Invention] In order to use the metal complex of the above-mentioned conventional technique for the piston for internal combustion engines, in addition to the abrasion resistance of the ring groove section and a sliding surface, it is necessary to raise the rigidity of the whole Magnesium alloy just like aluminum. However, although it had abrasion resistance enough in the metal complex of the above-mentioned conventional technique, the part which is not strengthened for wear-resistant improvement was inadequate [rigidity] for using for the required piston for internal combustion engines from the rigid field, in order to become only a Magnesium alloy and to use it by the severe condition.

[0005] Then, this invention makes it a technical technical problem to constitute the piston for internal combustion engines equipped with sufficient rigidity while being equipped with sufficient abrasion resistance by using fly ash.

[0006]

[Means for Solving the Problem] In order to solve the above-mentioned trouble, invention of claim 1 carried out injection molding of the ingredient which mixes the particle of fly ash, and the chip of a Magnesium alloy, and changes in the state of half-melting, and constituted the piston for internal combustion engines.

[0007] According to this invention, it becomes possible to acquire to coincidence the abrasion resistance which fly ash has by a Magnesium alloy being mixed with fly ash, and the property of rigid both. That is, while having sufficient abrasion resistance, the rigid high piston for internal combustion engines can be offered. By adopting the CHIKUSO cast as shown by claim 2 as injection molding, since HIKE and the HIKE crack on the front face of a piston decrease and dimensional accuracy improves further, it is suitable.

[0008] Here, it is the combustion ashes which fly ash meant the fine grain combustion ashes generated

by combustion of lime, for example, gathered for the dust collector of the incinerator of an electric power company, the fusion furnace of cast iron works, and the blast furnace of iron-manufacture works, and can obtain very cheaply.

[0009]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 1 is the sectional view of the piston for internal combustion engines in the gestalt of this operation.

[0010] As shown in drawing 1, the piston 1 for internal combustion engines extends to the down side from the piston crowning 2 in which ring groove 2a, 2b, etc. are formed, and the piston crowning 2, and consists of the piston skirt section 3 which makes a pair in the piston diameter direction, and the boss section 4 in which a pair is inserted in nothing and the piston pin which is not illustrated in the piston diameter direction which intersects perpendicularly with the piston skirt section 3. The base material of the piston 1 for internal combustion engines is fabricated by injection molding which mentions the powder of a Magnesium alloy and fly ash later using the ingredient which mixes and changes, and is equipped with abrasion resistance and rigidity.

[0011] In addition, the fly ash used with the gestalt of this operation consists of components (MgO , K_2O_5 , Na_2O , TiO_2) of 25% of the weight of aluminum $2O_33$, 40% of the weight of SiO_2 , 20% of the weight of ZnO , 5% of the weight of Fe_2O_3 , 2% of the weight of CaO , and 8% of the weight of others, and the particle size exists within the limits of 0.1 micrometers - 50 micrometers. Moreover, the chip of ASTM specification and AM60 alloy is used as a Magnesium alloy, and the particle size of a chip is within the limits of 1.0 micrometers - 50 micrometers.

[0012] Shaping of the piston 1 for internal combustion engines in the gestalt of this operation is explained. Injection molding adopted with the gestalt of this operation shall perform injection molding using the CHIKUSO cast known conventionally with shaping of the exterior equipment of home electronics etc. The CHIKUSO cast making machine 6 of the gestalt of this operation is shown in drawing 2. The CHIKUSO cast making machine 6 is constituted by the metal mold 12 which fabricates the ingredient feeder 7, the high-speed injection unit 8, the heater 10 that heats the ingredient in a cylinder 9, the screw 11 arranged pivotable in a cylinder 9, and the ingredient injected from the cylinder 9.

[0013] Injection molding is explained. First, the powder of fly ash is mixed with a Magnesium alloy, and it supplies in the ingredient feeder 7. The supplied ingredient is injected by the high-speed injection unit 8 in a cylinder 9, and it is stirred by rotation of a screw 11 within a cylinder 9 while it is heated at about 590 degrees C at a heater 10 and will be in a half-melting condition (thixotropy condition). If shearing force is given to the ingredient of a half-melting condition by rotation of a screw 11 and solid phase granulates, viscosity will fall and a fluidity will improve. It is injected into metal mold 12 through nozzle 9a of a cylinder 9, without touching with atmospheric air, it is cooled within metal mold 12, and the ingredient of such a fluid good half-melting condition constitutes the original form of the piston 1 for internal combustion engines. The piston 1 for internal combustion engines is fabricated by processing the top face of the piston crowning 2, while carrying out cutting of ring groove 2a, 2b, and the boss section 4 to the original form of the piston 1 taken out from metal mold 12.

[0014] Thus, tensile strength evaluation of the fabricated magnesium composite is shown in Table 1, and wear evaluation is shown in Table 2. As for ten volume % and the development material 2, the development material 1 in Table 1 and Table 2 is [the rate of the volume of fly ash of 20 volume % and the development material 3] the ingredient of 30 volume %.

[0015]

[Table 1]

| | 引張強度 (MPa) | | 硬さ (HB) |
|-----------------|------------|-------|---------|
| | 室温 | 250°C | |
| 開発材1 | 180 | 60 | 95 |
| 開発材2 | 185 | 65 | 110 |
| 開発材3 | 175 | 65 | 120 |
| マグネシウム母材 (AM60) | 170 | 45 | 63 |
| アルミニウム母材 (AC8A) | 286 | 121 | 125 |

[0016]

[Table 2]

| | 摩耗量 (mm) |
|-----------------|----------|
| 開発材1 | 12 |
| 開発材2 | 5 |
| 開発材3 | 3 |
| マグネシウム母材 (AM60) | 30 |
| アルミニウム母材 (AC8A) | 7 |

[0017] According to the above-mentioned table, when the volume of fly ash was made to increase within the limits of 10 - 30 volume %, it turned out that tensile strength, hardness, and abrasion resistance improve, so that many fly ash was contained.

[0018] Thus, rigidity becomes high while the fabricated piston 1 for internal combustion engines is equipped with sufficient abrasion resistance, since the abrasion resistance and rigidity of fly ash are acquired by coincidence. Moreover, by having adopted and carried out injection molding of the CHIKUSO cast, HIKE and the HIKE crack on the front face of a piston decrease, and dimensional accuracy improves. Furthermore, it leads also to saving resources or recycle by using the fly ash which is industrial waste, and is suitable also from an environmental field.

[0019] As mentioned above, although the gestalt of operation of this invention was explained, as long as intention that this invention is limited to the gestalt of the above-mentioned operation is the piston for internal combustion engines of a gestalt which there is not and met the meaning of this invention, it may be what kind of thing.

[0020]

[Effect of the Invention] Since the abrasion resistance which fly ash has by mixing magnesium with fly ash, and the property of rigid both are acquired by coincidence according to this invention, while having sufficient abrasion resistance, the rigid high piston for internal combustion engines can be offered.

Moreover, by adopting the CHIKUSO cast as injection molding, as claim 2 shows, HIKE and the HIKE crack on the front face of a piston decrease, dimensional accuracy improves, and it is suitable.

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] The piston for internal combustion engines constituted by carrying out injection molding of the ingredient which mixes fly ash and a Magnesium alloy and changes in the state of half-melting.

[Claim 2] Said piston for internal combustion engines is a piston for internal combustion engines of claim 1 characterized by carrying out injection molding using the CHIKUSO cast.

[Claim 3] The ingredient of said piston for internal combustion engines is a piston for internal combustion engines of claim 1 characterized by mixing the fly ash of 10 - 30 volume %, and the Magnesium alloy of 70 - 90 volume %, and changing.

[Claim 4] The ingredient of said piston for internal combustion engines is a piston for internal combustion engines of claim 1 characterized by containing the fly ash of 5 - 25 volume %, the alumina fiber of 5 - 15 volume %, and the Magnesium alloy of 70 - 90 volume %.

[Translation done.]